

ALTERNATIVE APPROACHES TO PROVIDING TRANSPORT FOR THE
HANDICAPPED

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Abstract:

This paper considers issues associated with the provision of transport services for the handicapped. Problems in estimating numbers of handicapped people disadvantaged by the present transport system are discussed. A preliminary classification of handicapped people on the basis of their ability to use different forms of transport is proposed. Two approaches to the problems of providing transport for the handicapped are examined: modification of public transport vehicles to allow access by the handicapped, and the introduction of specialised transport services to meet particular needs of the handicapped. Aspects of these two approaches are examined using examples from programmes operating in North America.

INTRODUCTION

In recent years there has been an increasing awareness of the problems experienced by the handicapped in using community facilities and services. In Australia most of these services and facilities are designed for use by the able bodied and make little or no provision for the special needs of individuals with physical or mental disabilities. Some progress has been made in the improvement of building design, pedestrian facilities and motor vehicle conversion to allow easier access by the handicapped. However, there still remains a multitude of barriers which the handicapped person must overcome in participating in normal life. One of the most obvious barriers is the transport system, especially public transport vehicles.

Little research or experimentation in the field of transport for the handicapped has been undertaken in Australia. However, the designation of 1981 as the Year of the Disabled and the consequent concern of Government agencies that initiatives should be taken to improve facilities for the handicapped has resulted in a number of studies.

Research on the handicapped in South Australia has commented on the problems of transport. The South Australian Committee on the Rights of Persons with Handicaps (The Bright Report) described problems facing handicapped people using public transport and recommended a number of modifications to vehicles. Definition of problems and recommendations did not seriously address matters of cost and ultimate benefits to handicapped people in South Australia.

More specialised research has examined the range of transport services provided by institutions and organisations for the handicapped. One report (Pak Poy, 1978) made recommendations for the rationalisation of these services in the interests of efficiency. The study was limited to transport services owned or operated by institutions for specific work, rehabilitation, medical or educational trips and did not attempt to deal with transport needs outside these specific trips. However, the study did recognise that the transport systems examined in no way catered for the majority of handicapped people in South Australia.

Unfortunately there is no easy way of defining the need for additional or improved services outside the sphere of institutional transport. The number of handicapped people disadvantaged by the transport system is difficult to estimate and the nature of these disadvantages vary enormously. The degree of latent demand for either improved or new services for handicapped people needs to be investigated. However, the advantage of spending a great deal of time and resources in attempting to define this problem, is questionable.

The accuracy of any estimates produced will always be doubtful. It is probably more valuable to examine the sorts of alternatives which are available and to test these systems to determine their usefulness.

One alternative, experimentation with modifications to public transport vehicles, designed to allow easier access, has had mixed results in Europe and North America where considerable research has been undertaken into transport for the handicapped. Alternative transport systems designed for specific needs of the handicapped have also been developed in several countries. No single strategy for improving transport has emerged. However, there are some important lessons to be learned from these experiences and any investigation of transport needs of the handicapped in Australia should acknowledge this research.

This paper discusses a number of issues concerning the provision of transport for the handicapped. These issues have been researched as part of a South Australian Study being carried out this year. Unfortunately there has not been an opportunity to undertake survey work or develop any test programmes to date. Therefore, this paper reflects some preliminary thoughts only.

Firstly, the paper discusses the difficulties of estimating the numbers of handicapped people disadvantaged by the present transport system and of defining problems of different elements of the handicapped population.

Secondly, the paper discusses two approaches to the provision of transport for the handicapped mentioned before: modification of conventional public transport vehicles and the introduction of specialized services. Some conclusions about the direction which could be followed in the development of policies are drawn from this discussion.

DEFINING THE PROBLEM

Estimating Numbers of Handicapped

Very little information is available in Australia either through census, survey or analysis of statistical information, to provide an adequate estimate of the number of handicapped people disadvantaged by the transport system. Reports of studies undertaken in Sydney by the former Public Transport Commission and by the Ministry of Transport in Victoria are currently under embargo and it is difficult to know what methods of estimating numbers were used. (1)

For the purposes of the South Australian study existing official published statistics were examined to determine numbers within the groups broadly classified as "handicapped". The Australian Bureau of Statistics Census of Population and Housing, 1976 provides information on numbers by age group who answered that they suffered from handicaps which limit their ability in "Getting About Alone". A strong correlation between age and handicaps can be drawn from these figures. Approximately

(1) From conversations with officers in the respective departments, it is evident that only fairly broad estimates were used.

TRANSPORT FOR THE HANDICAPPED

60% of respondents who had difficulty in getting about alone are in the age group 60-75+ with the largest group over 70 years. In view of projections for a rapidly increasing aged population it can be expected that the elderly will continue to make up a significant sector of the handicapped population.

TABLE 1.

Respondents Answering that Handicaps Limit Ability for "Getting About Alone".

Adelaide Statistical Division

<u>Age</u>	<u>Number of Persons</u>
0 - 9	438
10 - 14	435
15 - 19	460
20 - 24	449
25 - 29	352
30 - 34	280
35 - 39	233
40 - 44	208
45 - 49	395
40 - 54	551
55 - 59	598
60 - 64	735
65 - 69	921
70 - 75	995
75+	4,202
Total	11,252

Source: ABS 1976 Census, Table 40001 Handicaps x Age x Sex for LGAs in the ASD and Subdivisions for the Rest of the State.

Some difficulties have been experienced in gauging the accuracy of the results from the census 'handicap' question asked in 1976. The question will not be included in the 1981 Census of Population and Housing. A major problem with the 1976 results was that 60% of people who reported in the Census that they were handicapped, then indicated that they were not handicapped when interviewed in the post-enumeration survey. 33% who indicated in both the Census and survey that they were handicapped gave inconsistent answers as to the nature of their handicaps (Australian Bureau of Statistics, 1979).

A survey carried out by the Australian Bureau of Statistics, (ABS, 1974) attempted to obtain information about the incidence of chronic illnesses, injuries and impairments, the nature of the conditions and the extent to which they affect people in daily life. Figures from the survey on the incidence of chronic limiting illnesses are similar to those from the 1977-78 Health Survey.

The 1974 Survey included a question to handicapped respondents on whether they are prevented from "Getting About Alone". It is interesting to note that this section of the survey differentiates between institutionalised and non-institutionalised persons suffering chronic limiting conditions. The inclusion of the institutionalised population in other Tables greatly exaggerates the limited mobility and severity of handicaps of the general handicapped population and therefore exaggerates the latent demand for transport services. Non-institutionalised handicapped people are much more likely to use specialized transport services if they are available. Table 20 "Non Institutionalised Persons Suffering from Chronic Limiting Illnesses - Prevented from Getting About Alone" shows 17,500 persons in South Australia (ABS1974).

In summary then, the best information from the ABS sources shows a range of figures from 11,252 persons in the Adelaide Statistical Division (ABS Census 1976) to 17,500 "non-institutionalised" persons in South Australia (ABS 1974) whose handicaps limit them from "Getting About Alone".

Estimates of the population in South Australia over 60 years for the years 1978 to 2011 are available from estimates prepared by the State Government Working Group on Household Formation in 1979. The elderly population is already a significant percentage of the total population and is expected to increase over the next 30 years (see Table 2). A proportion of elderly people appear to have relatively good mobility, people over 65 years holding driving licences number 54,547 or 30% of the elderly population. A significant percentage of elderly people maintain independent living circumstances: 83% of persons over 65 years live at home, either rented or owned, alone or with family or friends. In addition, 6,647 persons live in independent living units in aged persons villages or complexes. (South Australian Health Commission, 1978). While these figures show a high degree of independence in living situations, the fact that a significant proportion of the total handicapped population falls within the group over 60 years suggests a need for suitable transport services where they are not already available.

TABLE 2.
POPULATION OVER 60 YEARS OF AGE - SOUTH AUSTRALIA
MEDIAN PROJECTIONS 1978-2011

Age	1978	1979	1980	1981	1986	1991	1996	2001	2006	2011
60 - 64	55,020	55,233	56,098	57,765	65,972	64,463	59,209	64,530	76,669	93,515
65 - 69	46,276	47,842	49,071	49,830	52,682	60,036	58,612	53,970	58,789	69,722
70 - 74	33,013	34,293	35,564	36,885	42,600	45,041	51,232	49,943	46,117	50,241
75+	43,943	44,747	45,691	46,768	53,977	62,549	62,172	77,149	80,364	78,557
Total Population over 60	178,252	182,115	186,424	191,248	215,231	232,089	238,225	245,592	261,939	292,035
Total Population S.A.	1,292,285	1,303,639	1,315,354	1,327,453	1,391,904	1,454,070	1,507,777	1,550,485	1,584,871	1,616,584
Total Population over 60 as % of total population	13.7	13.9	14.1	14.4	15.4	15.9	15.7	15.8	16.5	18.0

Source: State Government Working Group on Household Formation.

Population Projections 1978-2011

Problems of Identifying the Handicapped

As discussed in the previous section there is no easy way of identifying the number of handicapped people in South Australia who are disadvantaged by the present transport system.

The handicapped are a diverse and disparate group. The degree of difficulty individual people experience using conventional forms of transport is dependent on the types and severity of physical and mental disabilities suffered and also importantly on age, income and resources available to them to purchase transport services. For example an individual with a seemingly severe handicap (e.g. wheelchair confined) could lead a completely independent life using a standard form of transport such as a modified motor vehicle. Others with perhaps less obvious physical disabilities, (e.g. frailty through age or arthritic conditions) may suffer considerable disadvantages in their ability to get around.

The handicapped population is not organised into a united group or groups. Numerous organisations representing specific disabilities exist although many handicapped people have no association with these groups. Some groups associated with rehabilitation, sheltered workshops or educational institutions are exceptions, but generally groups are not cohesive and can provide little information, not only on the number of people affected by a particular disability but also on the specific transport needs of the disabled.

With these limitations in mind an attempt was made to draw up a framework for a very general classification of handicapped people with respect to their ability to use transport.

- (a) Those who can use conventional transport systems if available, e.g. fixed route bus services, private motor cars, standard taxis etc. without much difficulty.
- (b) Those who can use conventional public transport systems but with such difficulty that their trip making is restricted and they are forced to rely on assistance during the trip or find other methods of transport.
- (c) Those who are unable to use conventional systems of transport but can use specialised transport e.g. door-to-door services, vans and buses with special equipment, if available.
- (d) Those who are so severely disabled or ill that they are never or rarely able to travel except in ambulances or clinic cars for specific medical trips or in emergencies.

TRANSPORT FOR THE HANDICAPPED

This simple classification of the degree of mobility problems of handicapped and elderly people does not differentiate between types of illnesses or disabilities but merely defines level of ability for using different types of transport.

More sophisticated methods of classification exist which are based on illness or disability groups and specific mental or physical limitations related to aspects of transport facilities. (1)

TWO APPROACHES TO PROVIDING TRANSPORT FOR THE HANDICAPPED

There are two basic approaches to providing public transport for handicapped groups.

The first is to convert transport systems to allow access by all groups including those presently unable to use conventional public transport.

The second is to either create or rationalise specialised transport systems for the elderly and handicapped. These services can be either government or privately run, can link into conventional public transport systems or remain separate and can use a variety of methods of operation.

The discussion which follows examines these two approaches:

- . conversion of conventional public transport, and
- . specialized services

and outlines their advantages and disadvantages in terms of cost and service provided.

Conversion of Conventional Public Transport

In response to a growing awareness of problems encountered by handicapped people using conventional public transport systems, vehicle modification has been put forward as one possible solution. Research and experimentation with vehicles designed to allow easy access by a range of handicapped groups has taken place in Britain, Europe and the U.S.A. The objective of vehicle modification or special design of new systems is to provide system wide accessibility by all groups and to contribute to the "barrier free" environment. However there are several basic shortcomings of such an approach:-

(1) For example, a survey of the handicapped in the U.S.A. used the type of physical impairment involved or the availability of conventional transport services to classify the transport disadvantaged (Grey Advertising Inc. 1978).

- (i) Handicapped Are Not an Undifferentiated Group. Improvements and changes in general cannot be tailored to individual needs. Modifications will not significantly increase use by the handicapped. Evidence points to the probability that a small sector of people presently disadvantaged by their inability to use public transport will still be unable to use it whatever modifications are made to vehicles, stations etc.
- (ii) Modifications are Expensive. The expense of undertaking modifications to conventional public transport systems is considerable and will increase pressure on public transport operators trying to cope with accelerating costs of operation and maintenance.
- (iii) Technical Problems. Major vehicle modification has encountered significant technical problems which reduce the effectiveness of the changes.

Some examples from recent research and programmes for modification of conventional transport systems in Britain, U.S.A. and Europe can be used to illustrate these points.

- (i) Handicapped are not an Undifferentiated Group. In the U.S.A. legislation and regulations specifying features to be incorporated in modified transit vehicles are based on an undifferentiated image of the types of users the transport disadvantaged make of the system. For example modifying standard vehicles will do little to increase the mobility of the severely handicapped.

In a survey of the San Diego region only 24% of unmet demand for travel by handicapped people could be satisfied by conventional public transport and only then if special equipment was used. The remaining 76% of unmet demand required door-to-door service. (de Leuw Cather, Bigelow - Crain Associates, 1976).

In Britain a survey of handicapped people found that walking distances to stops was an important determinant in whether public transport was used. (Feeney et.al.) The survey also found that operational factors and the publication of information were important. The report concludes that door-to-door transport is the only means of meeting the potential demand from the handicapped with serious walking difficulty.

For any improvement in access by handicapped people every vehicle in a public transport system must be modified. Handicapped people will still be disadvantaged if only a selected number of vehicles are modified due to long headways between suitably equipped vehicles.

Factors other than vehicle design will continue to prevent use of conventional public transport by a significant sector of handicapped people. The physical problem of reaching bus stops and train stations is often prohibitive. Similarly, transfers between two modes can also prove difficult. Other factors which to a greater or lesser degree affect all passengers; rush hour traffic, curb heights, crowds, weather conditions, limited time allowed for seating and disembarking before the vehicle moves off.

TRANSPORT FOR THE HANDICAPPED

In any study of the transport needs of the handicapped the efficiency of modifying conventional public transport to meet these needs must be critically examined. The numbers of handicapped passengers who will benefit from changes to vehicles will be limited. Vehicle modification in itself is not a complete answer to the problem.

(ii) Modifications are Expensive. Probably the best example of concerted Government attempts to make conventional public transport systems accessible to handicapped people is the Transbus Project of the Urban Mass Transportation Administration (UMTA) of the U.S. Department of Transportation (DoT). This project has as its objective, system-wide accessibility of bus-based public transport systems. In 1971 UMTA called for the development of a prototype bus with certain features for easy accessibility by the handicapped. In 1977 a Transbus mandate was issued requiring full size buses bid after September 1979 to comply with Transbus specifications developed over the previous years. However no bids were received from manufacturers in response to procurement of 530 buses to Transbus specification issued by a consortium of three transit properties in Los Angeles, Miami and Philadelphia.

Criticism of technical aspects of Transbus specifications has led to widespread questioning of the financial sense of committing funds to buses which will cost more initially and will also have expensive long term maintenance requirements. The Transbus specification would produce a bus more costly than standard "New Look" buses presently operating in the U.S.

Rail systems in the U.S. are required to meet the needs of handicapped passengers (Metropolitan March/April 1980.) The Department of Transportation's Section 504 regulation requires transit agencies receiving DoT funds to make rail stations accessible. Five cities operating rapid rail systems, New York, Chicago, Philadelphia, Cleveland and Boston do not have special access for the handicapped. The regulation specifies that "key stations" must be made accessible to the handicapped within specified periods of time. The estimated cost of making key stations in rapid rail systems accessible is \$US1 billion. An alternative to key station conversion can be used if public consultation with affected groups shows that the alternative is as good or better than "key station" conversion. The "key station" conversion also applies to commuter rail systems. Estimated cost of conversion is \$US290m. In both Rapid Rail and Commuter Rail systems one car per train must be accessible for wheelchair users within 5 years (Rapid Rail) and 10 years (Commuter Rail).

Light rail systems are also required to be accessible to the handicapped. During peak hours one half of vehicles are to be accessible. The estimated cost of conversion is \$US33m.

Where a rail transit operator cannot provide accessibility within 3 years an interim service must be provided through buses, vans, taxis etc. Communities receiving UMTA funds must prepare a transition plan to identify the improvements and policies needed to achieve transit system accessibility and provide an interim service.

Two systems, the Bay Area Rapid Transit (BART) rail system in San Francisco and the Metropolitan Atlanta Rapid Transit Authority (MARTA) are actually operating with features designed to assist access by handicapped people.

Facilities for the handicapped built into the BART system cost approximately \$US8m over and above the cost of the basic system. Funds for these facilities were raised separately after a protracted campaign by handicapped groups for special facilities to be installed. The range of facilities designed for BART is impressive:

- corridors, gates, fare collection systems in termini designed for the non-ambulant;
- elevators and ramps to facilitate level change and elimination of changes between platforms and carriage floors;
- braille plaques, loudspeakers, closed circuit TV;
- accessible toilets and rest rooms;
- telephone and drinking fountains low enough to be used from a wheelchair;
- wide aisles and seats in carriages with rails, grips etc.;
- special training for BART staff;
- fare reduction and special fares for a combination of BART and municipal bus services.

However a review of the BART system some years after its opening (Levine, 1974) shows that facilities for the visually and audibly handicapped were not yet provided. Many elevators were awkwardly located for the physically handicapped and level access and egress for passengers from buses transferring with BART was not available.

The MARTA system in Atlanta was designed with similar modifications as those to the BART system:

- wide doorways;
- special fare gate;
- wider elevators with special features;
- non slip surface floor;
- white warning strip on platform;
- public address system, blinking exit signs (for deaf);

TRANSPORT FOR THE HANDICAPPED

- extended railing on staircases;
- reserved space for wheelchairs on train.

In addition, a special feeder bus MARTA "L-Bus" outfitted with lifts provides door-to-door service for the handicapped.

In general it can be expected that modifications to conventional public transport whether design of bus specifications (Transbus) or system-wide adaptation to the needs of the handicapped (BART and MARTA) will be extremely costly. Even modifications to existing buses, such as the installation of hydraulic lifts are expensive. Operating and maintenance costs are higher.

(iii) Technical Problems. Numerous technical problems have been encountered in modifying vehicles. The best documentation of these problems is on the Transbus specifications. On all three Transbus prototypes wheelchair lift operation is unsatisfactory and none work well enough to be incorporated into regular production. Another oversight was the door. The Transbus 40 inch door can accommodate a wheelchair but not two persons, yet the door is too wide for one person to grasp both handrails easily. The prototypes have higher maintenance costs and less efficient fuel economy than standard buses in the USA.

Use of conventional route buses for the handicapped has inherent problems of operation with lifts and ramps, stowing wheelchairs, need for driver training and assistance. Even if technical problems can be overcome the very nature of conventional bus and rail systems will present difficulties for the handicapped. Schedules, speeds, methods of operation and driving, location of stops and stations are designed for maximum efficiency of the total transport system and will be difficult to adapt successfully to cater for the specific needs of individual handicapped people.

One of the first transit agencies in the US to initiate a large scale accessible bus project was the Bi-State Development Agency of South Western Illinois and St. Louis, Missouri. The programme which has been operating since 1977 has suffered serious problems with unreliable lifts and mechanical malfunctions. The service began with 164 wheelchair related trips recorded per month (compared with 20,000 non-wheelchair or regular trips) and by late 1979 had dwindled to one handicapped rider per day. (Houghton, 1980).

Similar problems have been experienced in Milwaukee where wheelchair lifts are also used on regular bus routes. Of 100 lift equipped buses only 60 are currently operable at one time. Ordinary maintenance requires additional expenditure of \$US1500 per lift. Ridership is extremely low - less than one trip per day. It is estimated that since the service opened in 1978 no more than 15 separate individuals have ever used the lifts. (Mayer, 1980).

In consideration of any modification to existing or new public transport systems the factors of costs and benefits must be critically examined. Adequate predictions of the numbers who will be able to use the system without difficulty will be needed. Taking these factors into account alternative methods of transporting the handicapped must then be examined for a comparison of costs and the numbers which can be served.

Specialized Services

In spite of moves to adapt conventional public transport systems to the needs of handicapped people, the most significant advances have been made in the provision of specialized services. The advantages of these specialized services are that they can be designed to meet different needs, and can ideally be co-ordinated to ensure total coverage and avoid duplication. For example, needs are varied ranging from door-to-door, door-through-door and wheelchair accommodation. Vehicle characteristics can be matched to the various market segments.

A number of specialized transport services have been implemented in Canadian and US cities. Their characteristics and scope vary, but they are similar in their aim to provide a specialized service for handicapped and elderly people separate from conventional transport systems. It is useful to examine some of the features of a selected number of services.

In Cleveland, Ohio, a personalised door-to-door service for elderly people in three neighbourhoods (17,000 old people) is provided by the Cleveland Regional Transit Authority. 12 buses operate a daily service at \$US0.10 cents per ride (Crain, 1977).

In Toronto the Transit Commission has initiated a pilot project for physically handicapped people in which door-to-door transport is provided. The project was given an operating subsidy of \$Can.14,000 p.a. at a regular \$Can.0.25 cent fare.

In Milwaukee, a User Side Subsidy Programme (USSP) provides transportation to persons confined to wheelchairs, by means of private taxi and chair-car carriers. The programme subsidises any costs over \$US1.00 for each one-way trip. There are maximum subsidy limits of \$US10.00 for the wheelchair confined and \$US7.00 for other eligible persons. By late 1979 USSP was subsidising 7,600 trips per month at \$US6.40 per trip (Mayer, 1980).

In St. Petersburg, Florida, a jointly funded demonstration project TOTE (Transportation of the Elderly) provided door-to-door service covering 13 sq. miles, transporting 10,500 passengers per month with 13 van style vehicles (2 with lifts). The system was operated through a reservation service requiring 24 hours notice. When the service folded in 1975 a new service Dial-A-Ride-Transit (DART) was set up to provide a similar function. The DART system carries 6,500 passengers per month over 58 sq. miles using 8 vans. The service operates on an annual budget of \$US160,000.

TRANSPORT FOR THE HANDICAPPED

St. Petersburg also offers other services to its elderly and handicapped citizens. These include a One-Half Fare programme for the over 65's and the handicapped, a "kneeling" bus on regular service runs, courtesy seating in all buses and a Free Attendant Programme on regular system buses as well as on DART.

It appears that St. Petersburg has attempted to provide alternative services for the elderly and handicapped through a service for those unable to use conventional public transport and low cost improvements to existing buses to assist in making them more accessible (Schreiber, 1978).

The City of Edmonton, Canada has introduced a demand responsive transport system for the handicapped to provide trips for work, educational and medical purposes. 14 vehicles with 8 - 15 seating capacity are used. Registration for the service is required and trips may be either reserved 24 hours in advance or booked by subscription. The vehicles are also available for charter. In 1976 the service's total cost was \$Can.609,000 (equivalent to \$Can.1.10 per capita for Edmonton's population).

Some problems with dispatching and scheduling have been experienced with up to 20% of trips cancelled. Difficulties have been experienced with manual dispatching/rescheduling to accommodate cancellations.

Home origins for trips were randomly distributed throughout the service area but there was a distinct clustering of non-home activities (e.g. university, hospital). Non-home destinations accounted for 75% of all trip destinations. A vehicle occupancy of 1.2 - 1.7 passengers per hour was recorded (IBI Group, 1979).

A similar service using two, six wheelchair passenger buses in Saskatoon, Canada experienced problems with serious overbooking, low bus occupancy rates and high operating costs. A third bus was introduced to operate on a 'zone', or flexible route service. This service limited trip destinations to the CBD and a major hospital. It provided door-to-door service but on a many-to-one basis with no pre-booking (Bergan, Watson, Ross, Rivett, 1979).

In Baton Rouge, Louisiana a special transport service (STS) for the handicapped was conducted under an 18 month service Development Grant of \$US171,050 with local matching funds in in-kind services of \$US85,525. The STS provided a free, pre-scheduled door-to-door service aimed at meeting medically related transportation demands. Clients were limited to pre-screened and eligible elderly and handicapped clients (McCall, Olson and Reed, 1976).

A private operator in Dallas, Texas runs a door-to-door service for the semi-ambulatory. Funds are provided from Federal, State and City Governments to purchase vehicles. The vehicles are leased to the operator at a minimum rate. A maximum one-way fare of \$US1.00 is charged. The service is available to "eligible" persons including those over 65 with walking difficulties, severe epileptics, persons with severe retardation, the blind and wheelchair confined persons (Passenger Transport, 1978).

In High Point, California a Dial-A-Lift system operates to provide door-to-door service to persons over 60 with a permanent or temporary disability. The system's administrators sell tickets to social service agencies. The agencies make tickets available to clients which reduces the need for agencies to provide transportation (Passenger Transport, 1977).

Specialized services for the handicapped, as demonstrated by the range of different systems described, can respond to individual needs of their clientele at a fraction of the cost of converting conventional public transport. The service can be operated on a trial basis and expanded or reduced as its usefulness and efficiency is assessed. Demand responsive door-to-door services also overcome many of the problems of conventional buses or trains. Door-to-door service overcomes the problem for the handicapped person having to reach a bus stop or station, often the most significant deterrent to using public transport. Assistance in boarding and alighting can be provided by trained personnel, and wheelchair lifts and other special aids can be more easily provided than on conventional vehicles.

Many of the specialized services discussed have been introduced as alternatives to the modification of conventional public transport vehicles. Comparative costs of these two alternatives are not readily available. However, it is evident that in terms of initial costs the provision of specialized services has the advantage. The examples of specialized services discussed in this paper are in most cases, operated by public transit authorities as an ancillary to regular services or as separate programmes funded either internally or from other sources.

There are few examples of specialized services for the handicapped operating in Australia. Privately run taxi-type services catering for handicapped passengers are now operating in Canberra and Adelaide.

The Independent Bus Service in Adelaide and the Maxi Taxi service in Canberra provide taxi-type service for the handicapped in specially equipped buses at commercial rates. These two services are meeting an important need for the handicapped and the potential for the development of these types of services, either in the form of additional commercial services or publicly-provided services, should be investigated.

CONCLUSIONS

This paper has identified a number of issues which will need to be investigated as part of developing approaches to the problem of providing transport to the handicapped.

It is necessary to define the sorts of problems facing the handicapped in using conventional forms of transport. The numbers of handicapped individuals who are disadvantaged by different forms of transport need to be clearly defined. The information available at present is not adequate to determine the priorities and problems which need to be addressed.

TRANSPORT FOR THE HANDICAPPED

A range of options for providing transport to handicapped groups should be developed and assessed in terms of the ways in which they could overcome existing problems. An analysis of costs and operating and administrative requirements should also be undertaken.

The most appropriate agencies or organisations which can be used to improve existing services or to introduce new services, for example, Government, semi-Government or private operator, need to be identified.

Finally, the policy issues involved in designing transport improvements for the handicapped will need to be addressed to define Government policies, the most important component of which will be the level of commitment of resources Governments are prepared to make in developing transport programmes to assist the handicapped.

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TRANSPORT FOR THE HANDICAPPED

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